ISSN 1346-7565

Acta Phytotax. Geobot. 68 (1): 33–38 (2017)
doi: 10.18942/apg.201611

A New Species of *Polyalthia* (Annonaceae) from Imbak Canyon, Sabah, Malaysian Borneo

HIROSHI OKADA[1, 2, *], HIROKAZU TSUKAYA[3] AND MONICA SULEIMAN[4]

[1]Institute of Natural and Environmental Sciences, University of Hyogo, Sanda, Hyogo 669-1546, Japan; [2]Osaka City University, Sugimoto, Sumiyoshi-ku, Osaka 558-8585, Japan. [*] author for correspondence; [3]Department of Biological Sciences, Faculty of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan; [4]Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

Polyalthia gracilicolumnaris H.Okada, Tsukaya & M.Suleiman (Annonaceae), a new species from Imbak Canyon Conservation Area, Sabah, Malaysia, is described and illustrated.

Key words: Annonaceae, biodiversity, Borneo, ICCA, new species, *Polyalthia*, Sabah, wet tropics

Polyalthia s.lat. (Annonaceae), consists of more than 150 species distributed from Africa to Asia and the Pacific islands. The genus, however, has been determined to be a polyphyletic genus based on molecular phylogenetic analyses. As a result, *Polyalthia* s.lat. is divided into four genera, *Hubera*, *Marsypopetalum*, *Monoon* and *Polyalthia* s.st. (Mols *et al*. 2008, Xue *et al*. 2011, 2012, Chaowasku *et al*. 2012, Xue 2013). Turner (2014) followed this classification when compiling the treatment of Annonaceae for Malaysian Borneo. He treated the species of *Polyalthia* s.lat. in Sarawak and Sabah as 2 species of *Hubera*, 1 species of *Marsypopetalum*, 11 species of *Monoon*, and 25 species of *Polyalthia* s.st.

Recently, we surveyed the Imbak Canyon Conservation Area (ICCA), Sabah, which is located in the central part of Sabah, just north of the Maliau Basin Conservation Area. This area remains as a well protected primary forest. There we collected a new and unusual arborescent species of *Polyalthia* s.st.

We collected fresh flowers in 50% (v/v) ethanol to observe details of the flower structure to compare with observations in the field. Measurements and observations of the whole flower, stamens and carpel utilized those samples.

Polyalthia gracilicolumnaris H. Okada, Tsukaya & M. Suleiman, **sp. nov.** —Figs. 1, 2, 3, 4

Polyalthia gracilicolumnaris is similar to *Polyalthia borneensis* Merr. in its cordate leaf base, creamy yellow or pale green flowers, clawed concave inner petals, but differs in having obovate leaves with a caudate apex and one or two carpels.

Typus. MALAYSIA, Borneo, Sabah, Tongod District, Imbak Canyon Conservation Area, Tampoi Base Camp - BBC Camp - Imbak Fall and beyond along the Imbak River, alt. 165–270 m, 6 Aug. 2015. *H. Tsukaya*, *H. Okada*, *T. Hayashi & M. Suleiman TOH-101* (holo- BORH, iso- HYO, TI)

Trees, to 6 m tall, columnar, 1–3 cm in diam. (Fig.1a, b). Twigs 20–30 cm long (Fig. 2a). Leaves petiolate; petiole 1–2 mm long; blade chartaceous, obovate, 4–6 × 2–2.5 cm, base subcordate, apex caudate, abaxially prominently puberulent, with long and short hairs on veins, adaxially glabrous except for long hairs on veins. Inflorescences terminal, solitary flowers; pedicel slender,

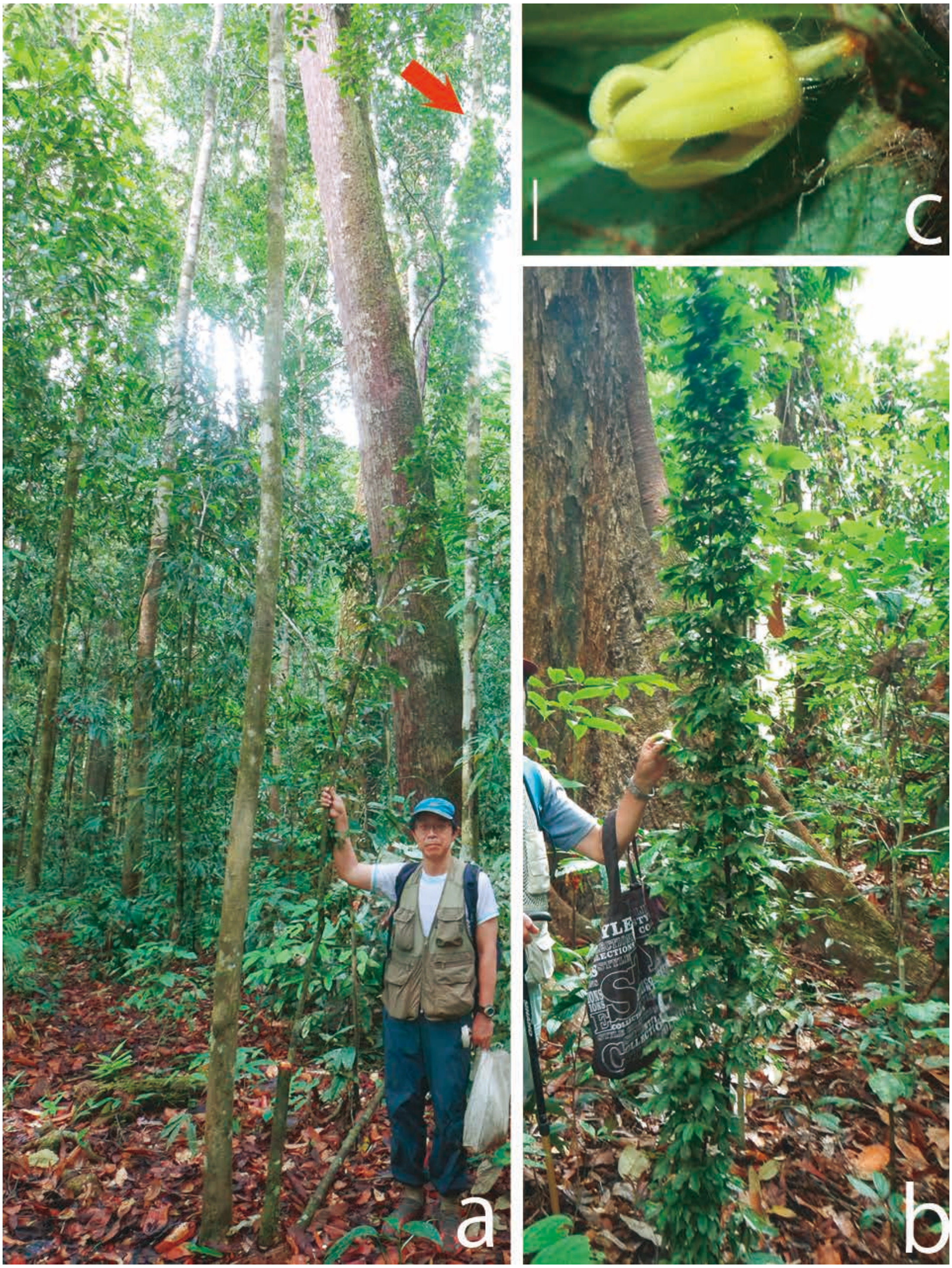

FIG. 1. Natural habit of *Polyalthia gracilicolumnaris*. a: The largest tree observed (a person holding tree is ca. 170 cm tall). Red arrow indicates tip of tree (ca. 6 meters tall). b: Middle-size tree (ca. 4 meters tall) showing slender, columnar growth form. Note that main stem is only about 1 cm in diameter and almost all branches are only 20–30 cm long. c: Creamy yellow flowers terminal on branch. Scale: 2 mm.

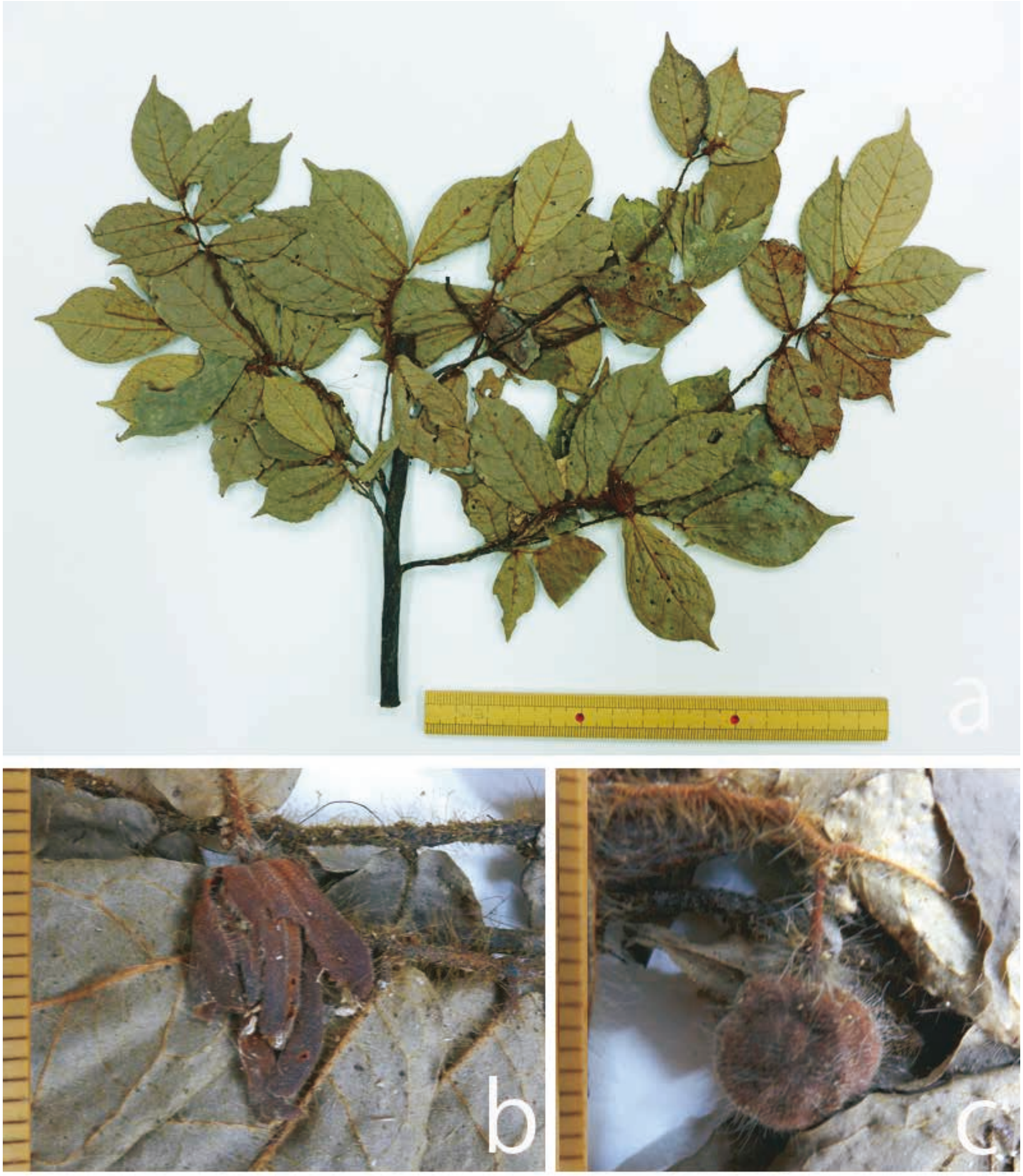

Fig. 2. Herbarium specimen (*Tsukaya & al. TOH-119*) of *Polyalthia gracilicolumnaris*. a: Central black stem is main stem of small tree less than 1 cm in diam. b: tomentose flower. c: hirsute, globose fruit. Scale for a: 15 cm, b and c: 1 mm.

2 mm long, 1 mm in diam., tomentose (Fig. 2b). Flowers creamy yellow or pale green (Fig. 1c), pendulous; sepals 3, broadly ovate, 2.5 mm long, 1.5 mm wide, apex acute, abaxially tomentose, adaxially glabrous below middle, puberulous above middle; outer petals 3, narrowly ovate, convex, 14 × 5 mm, both surfaces tomentose; inner petals 3, narrowly ovate, 12 × 3 mm wide, convex, abaxially tomentose, adaxially tomentose above middle, glabrous below middle, lower half concave (Fig. 3). Stamens many, sessile, connective flat-topped and concealing anthers; an-

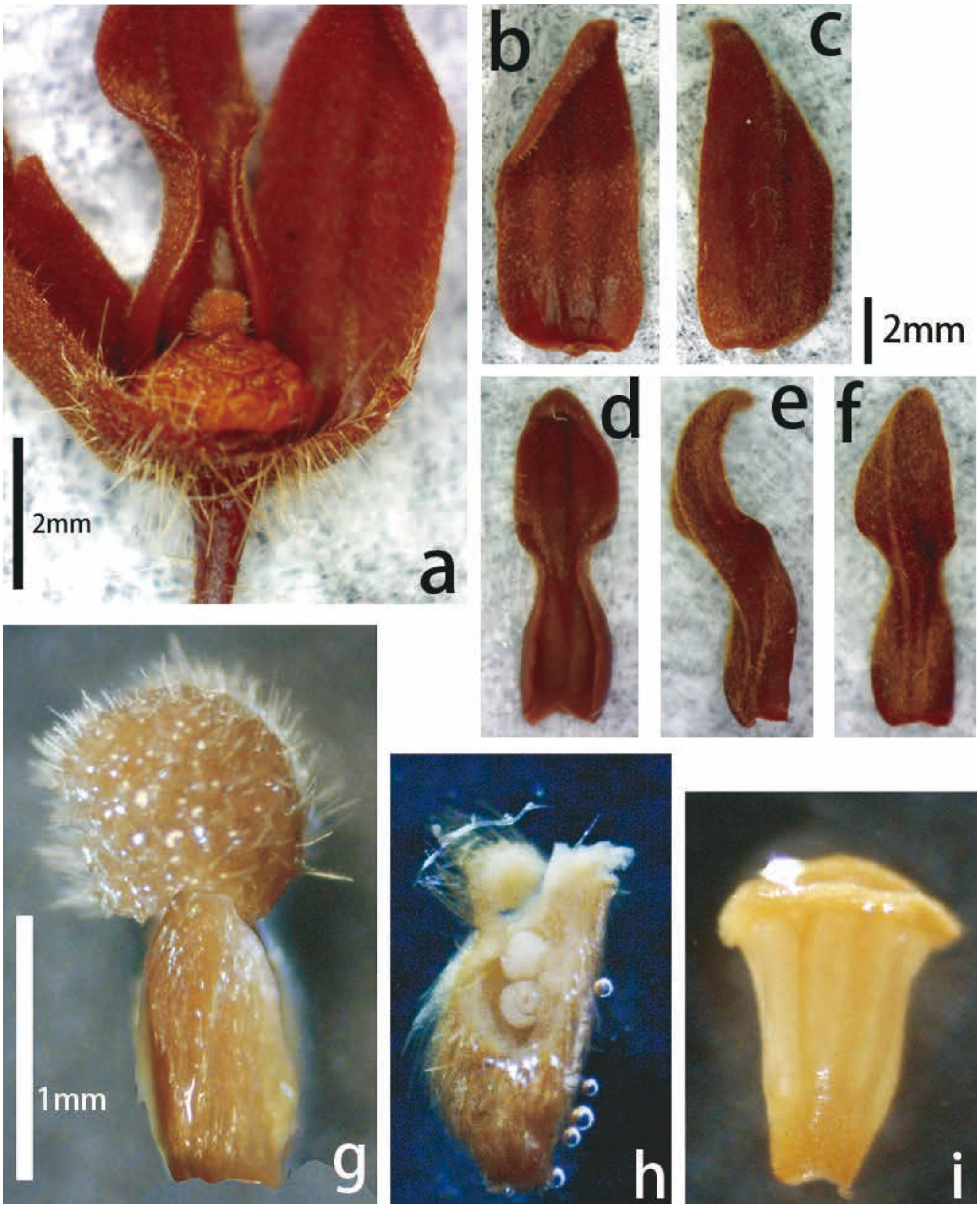

FIG. 3. Floral characteristics. a: whole flower with one outer petal and two inner petals removed to show many stamens and one carpel, b: inner view of outer petal, c: outer view of outer petal, d: inner view of inner petal, e: side view of inner petal showing concave base, f: outer view of outer petal, g: carpel, h: 2 ovules, i: stamen. Scale for a–f: 2 mm, for g–i: 1 mm.

thers 1 × ca. 0.5 mm; carpels 1 or 2, cylindrical, 2 × 0.7 mm, tomentose, stigma globose, hirtellous, 0.7 mm in diam; ovules 2. Fruit 1 or 2, globose, 9 mm in diam., hirsute (Fig. 2c).

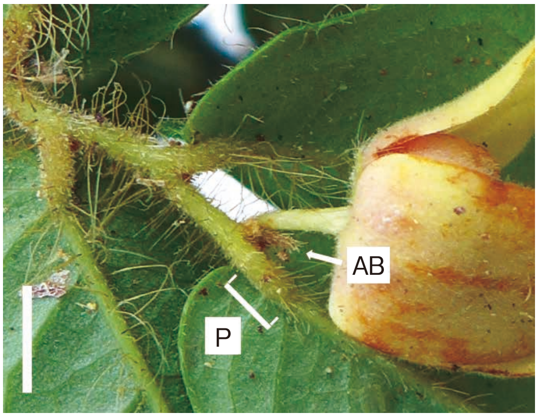

FIG. 4. Tip part of flowering branch. P: petiole, AB: axillary bud (a young leaf already developed). Scale: 2 mm.

Distribution. Only known in Imbak Canyon Conservation Area, Sabah, Malaysian Borneo.

Habitat. Lower layer of primary tropical rain forest near rivers with abundant trees of *Shorea* sp. (Dipterocarpaceae) about 30–40 meters tall.

Additional specimen examined. Malaysia, Borneo, Sabah, Imbak Canyon Conservation Area; from Kuli Station (N05°06′48″, E117°02′25″; alt. 312 m) to Maya Falls, along a branch of Imbak River to N05°06′47″; E117°02′56″, alt. 340 m, *H. Tsukaya*, *H. Okada*, *T. Hayashi & M. Suleiman TOH-109* (BORH), from Kuli Station to the car parking spot, along Imbak River, alt. 175−312 m, *H. Tsukaya*, *H. Okada*, *T. Hayashi & M. Suleiman TOH-119* (BORH, HYO, TI).

Specimen examined of P. borneensis. East Borneo: E. Kutei, G. Tepian Lobang on Menubar R., 75 m alt., coral limestone, treelet, flowers white, *A. J. G. H. Kostermans 5317* (BO), G. Tepian Lobang 150m alt., coral limestone rocks, treelet 5 m, flowers white, fragrant, pendulous, attached on lower side of the horizontal branches, *A. J. G. H. Kostermans 5423* (BO). Both specimens were cited by Turner (2014).

Notes. *Polyalthia gracilicolumnaris* has the unusual form of a tree by being slender columnar (Fig. 1). Because of their form and height, individuals can be seen from a distance. Mature trees have a slender, flexible main stem only 1–3 cm in diameter. Flowers and fruits on the upper part of the tree can be collected by bending the stem without it breaking. Short branches spread horizontally, and almost all of them, from bottom to top, are of similar length, about 20–30 cm. The annotation on *Kostermans 5423* (BO), identified as *Polyalthia borneensis*, states “Flowers … attached on lower side of the horizontal branches”. *Polyalthia gracilicolumnaris* appears to be a prototype to become a woody liana. The upper part of the tallest tree observed (6 meters tall) leaned on a branch of a taller neighboring tree.

Turner (2014) described the inflorescences of *P. borneensis* as being subopposite the leaves, often appearing terminal. *Polyalthia gracilicolumnaris* shows a close relationship to *P. borneensis* judging from morphological characteristics, but shows a different aspect in that the flowers are terminal position of the branch from the viewpoint of the position of the axillary bud between the pedicel (stalk of flower) and petiole (stalk of leaf) (Fig. 4).

We would like to thank Yayasan Sabah (Imbak Canyon Conservation Area) [access license JKM/MBS.1000-2/2 JLD.3 (97) and JKM/MBS.1000-2/2 JLD.3 (98)] and Imbak Canyon Management Committee (ICMC) for permitting access to the area and for permission to carry out the research (permission no. YS/ICMC/2015/16 and YS/ICMC/2015/24). Assistance from Miss Florina Anthony of Universiti Malaysia Sabah and the staff of the ICMC, especially to the forest rangers, Mr. David Francis and Mohd. Idris Zilmi, are duly acknowledged. Tsukaya received financial support from the Japan Society for the Promotion of Science (no. 15H05236).

References

Chaowasku, T., D. M. Johnson, R. W. J. M. van der Ham & L. S. Chatrou. 2012. Characterization of *Hubera* (Annonaceae), a new genus segregated from *Polyalthia* and allied to *Miliusa*. Phytotaxa 69: 33–56.

Mols, J. B., P. J. A. Kessler, S. H. Rogstad & R. M. K. Saunders. 2008. Reassignment of six *Polyalthia* species to the new genus *Maasia* (Annonaceae): Molecular and morphological congruence. Syst. Bot. 33: 490–494.

Turner, I. M. 2014. Annonaceae. *In*: Soepadmo, E., L. G. Saw, R. C. K. Chung & R. Kiew (eds.), Tree Flora of Sabah and Sarawak. Vol. 8. Forest Research Institute Malaysia, Kepong, Malaysia.

Xue, B. 2013. Molecular phylogenetics of *Polyalthia* (Annonaceae): identifying clades and morphological synapomorphies in a large polyphyletic genus. A Thesis for Ph.D. at The University of Hong Kong.

Xue, B., Y. C. F. Su, J. B. Mols, P. J. A. Kessler & R. M. K. Saunders. 2011. Further fragmentation of the polyphyletic genus *Polyalthia* (Annonaceae): molecular phylogenetic support for a broader delimitation of *Marsypopetalum*. Syst. Biodivers. 9: 17–26.

Xue, B., Y. C. F. Su, B. C. Thomas & R. M. K. Saunders. 2012. Pruning the polyphyletic genus *Polyalthia* (Annonaceae) and resurrecting the genus *Monoon*. Taxon 61: 1021–1039.

Received November 16, 2015; accepted March 22, 2016